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MINERALOGY.—*Notes on white chlorites.*[1] EARL V. SHANNON and EDGAR T. WHERRY, U. S. National Museum.

Although the name chlorite comes from the Greek word for green, various other colors are represented among this group of minerals, including violet-red in kaemmererite, and white in leuchtenbergite and other sub-species or varieties. The mineral colerainite, described in 1918 by Poitevin and Graham,[2] is in our opinion a white chlorite, since its composition, crystal form, optical properties, and physical properties are all similar in many respects to those of typical members of the clinochlore group. It seemed of interest to ascertain whether the material reported as colerainite from Brinton's Quarry, Chester County, Pennsylvania, by Mr. Samuel G. Gordon[3] could also be so classified, and Mr. Gordon kindly sent the Museum samples for examination and analysis. Sample 1 is composed of 3 to 5 mm. barrel shaped crystals, bounded by greatly rounded first and second order pyramids and prisms, with large basal planes. These are not solid, but have a dull white crust with loosely packed flaky material with pearly luster within. Under the microscope the material is fairly homogeneous, although some dull, opaque patches are present mingled with the transparent flakes. Specimen 2 is from a new locality discovered by Mr. Gordon, namely a small abandoned feldspar quarry about 2 miles southwest of Nottingham, Chester County, Pa. This is in more micaceous-looking and apparently less altered crystals of similar shape and size. Under the microscope its homogeneity is satisfactory. Similar material occurs also in feldspar quarries near Sylmar, Pa., but it is too altered for analysis; its crystallography is described below.

[1] Presented at the meeting of the Mineralogical Society of America, Dec. 29, 1921. Published by permission of the Secretary of the Smithsonian Institution. Received December 31, 1921.

[2] Canada Dept. Mines, Museum Bull. **27**: 66–73. 1918.

[3] Amer. Min. **5**: 195. 1920.

Another white chlorite of related composition is sheridanite, described from northern Wyoming by J. E. Wolff in 1912.[4] This differs considerably in properties, however, being a translucent greenish gray schistose rock. A specimen of schistose rock from Miles City, Montana, has recently been sent in to the U. S. Geological Survey for identification, and Dr. E. S. Larsen has found it to agree optically with sheridanite. This has also been analyzed, and found to have the same composition as the original sheridanite, so is here reported as a new occurrence of this mineral. In the analyses extreme care was taken to separate the aluminium from the magnesium, the aluminium hydroxide being reprecipitated several times. The results of the new analyses, with older ones for comparison, are presented in table 1.

TABLE 1.—ANALYSES OF WHITE CHLORITES. THE ASTERISKS INDICATE NEW ANALYSES AND OPTICAL DATA. THE NUMBERS IN PARENTHESES AFTER ANALYTICAL DATA ARE RATIOS

	1*	2*	3	4*	5	6
SiO_2	28.10(2)	36.70(6)	28.81(2)	27.78(2)	26.98(3)	24.40(2)
Al_2O_3	26.20(1)	10.38(1)	26.43(1)	24.30(1)	16.10(1)	22.77(1)
Fe_2O_3	1.66	1.22	0.24	1.43	0.22	0.45
FeO	none	trace	0.40	0.35	none	none
CaO	trace	0.86	none	trace	0.12	0.10
MnO	trace	trace	none	none	0.20	0.09
MGO	30.36(3)	36.44(9)	31.21(3)	32.71(3)	36.56(6)	32.70(4)
K_2O	...	...	0.35	...	0.28	0.30
Na_2O	...	...	0.14	...		
H_2O-	0.56	1.06	0.09	0.06	19.91(7)	19.63(5)
H_2O+	14.00(3)	13.80(7)	12.62(3)	13.01(3)		
Totals	100.88	100.46	100.29	99.64	100.37	100.44
Opt. data	*	*	...	*	*	...
α	1.562	1.555	1.580	1.576	1.570	...
β	1.562	1.560	1.581	1.576	1.570	1.570
γ	1.576	1.560	1.589	1.589	1.575	...
Sign	+	−	+	+	+	+
2E	0°	30°	35°	small	0°	0°

1. White chlorite from Brinton's Quarry, Pa. Analysis by Shannon; optical data determined on an exceptionally clean cut crystal and kindly furnished by Mr. Gordon.

2. White chlorite from Nottingham, Pa. Analysis by Shannon; optical data by Wherry.

3. Sheridanite, northern Wyoming. Analysis by Wolff, optical data by H. E. Merwin.

4. New occurrence of sheridanite (Wyoming?). Analysis by Shannon; optical data by Larsen.

5. Colerainite matrix, Quebec. Analysis by Connor quoted by Poitevin and Graham, loc. cit. Optical data by Wherry on specimen kindly furnished by Prof. T. L. Walker.

6. Colerainite crystals, Quebec. Analysis by Connor; optical data by Poitevin and Graham.

[4] Amer. Jour. Sci. IV, **34**: 475–476. 1912.

As to occurrence and origin, the Pennsylvania specimens are reported by Mr. Gordon to have been formed by the action on albite-pegmatite of magnesium-bearing waters derived from the weathering of serpentine and jefferisite.[5] The original colerainite had a similar origin.[6] The sheridanite occurs in granitic rocks, and may have also arisen through alteration of feldspar, but details of its occurrence are not known.

Both Pennsylvania minerals are rather different from colerainite in composition, but the first one agrees closely with sheridanite in this respect, although entirely different from it in physical properties. It is not possible at present to interpret the analyses of any of these in terms of end-minerals, so it seems best to class them all simply as white chlorites.

A crystallographic confirmation of the identity of these minerals seemed desirable, but the Brinton's Quarry and Nottingham material proved to be too dull on the surface to give definite results. Optical examination of the so-called secondary albite from Sylmar, Pa.[7] showed, however, that it is of similar character although too extensively altered to kaolinite to be suitable for analysis. It occurs in rosettes of subparallel crystal plates on compact albite rock, averaging 5 by 1 mm. in size, with perfect basal cleavage on which the luster is bronzy. These were found to give hazy light nodes as a number of places in each zone of faces, yielding the results shown in table 2.

TABLE 2.—ANGLES OF WHITE CHLORITE FROM SYLMAR, PA.

Crystallization perihexagonal; $c = 3.3890 \pm .0050$

No.	Letter	Symbols Gdt.	Symbols Brav.	Mono	Description	Observed φ	Observed ρ	Calculated φ	Calculated ρ
1	*c*	0	0001	001	Dominant form	..	0°	...	0°00′
2	*b*	∞0	$10\bar{1}0$	010 110	Narrow to fairly broad	0°	89–90°	0°00′	90°00′
3	*m*	10	$10\bar{1}1$	112 011	Narrow but distinct	0°	66–67°	0°00′	66°07′
4	*i*	4/30	$40\bar{4}3$	043	Narrow but distinct	0°	70–71°	0°00′	71°38′
5	*o*	20	$20\bar{2}1$	$\bar{1}11$	Narrow to fairly broad	0°	77–78°	0°00′	77°32′
6	*v*	1	$11\bar{2}1$	132 $\bar{1}01$	Rather large	30°	75–76°	30°00′	75°40′
7	*s*	½	$11\bar{2}2$	$\bar{1}34$	Narrow and poor	30°	63–64°	30°00′	62°56′

The identification of the material as a white chlorite is thus complete.

[5] Proc. Acad. Nat. Sci. Phila. **1921**[1]: 169–192. 1921.
[6] Trans. Royal Soc. Canada III, **12**: 37–39. 1918.
[7] Amer. Min. **3**: 47. 1918.

MINERALOGY.—*Crocidolite from eastern Pennsylvania.*[1] EDGAR T. WHERRY and EARL V. SHANNON, U. S. National Museum.

The occurrence of a glaucamphibole in the Highland belt of pre-Cambrian rocks of eastern Pennsylvania was noted by D'Invilliers in 1883.[2] He classed the mineral as an amphibole on the basis of a "rough analysis" by State Chemist McCreath made on "a portion of the mass more or less mixed with feldspar" which yielded, when the meaningless decimals are omitted: SiO_2 51.7, Al_2O_3 17.5, "FeO" (probably at least half Fe_2O_3) 9.2, MgO 8.8, CaO 5.1, and "undetermined" (no doubt $Na_2O + H_2O$) 7.7%. This corresponds more or less to a mixture of labradorite with a high magnesium glaucamphibole. In the absence of optical data, however, the exact identity of the latter could not be established.

Another occurrence of the mineral in the pre-Cambrian was studied by Mrs. Eleonora Bliss Knopf in 1913.[3] She classed the mineral as glaucophane on the basis of an analysis by Dr. Edwin DeBarr, but judging from the silica percentage of 83.3, this was made on a sample containing a large amount of quartz in addition to feldspar, and is accordingly unsuitable for establishing the exact nature of the mineral. Mrs. Knopf obtained in addition some optical measurements agreeing with those recorded for the glaucamphibole group, but not characteristic of any individual member: extinction angle $X/c = 3°$ to 15°, and pleochroism Z blue to violet, Y pale green, and X colorless to pale yellow.

While the senior writer was connected with Lehigh University, Bethlehem, Pa., he observed glaucamphiboles at many localities in the region, in both pre-Cambrian and Triassic rocks. On removal to Washington, he presented a number of specimens to the National Museum, and made a study of their optical properties, by the immersion method. Much of the material proved to be cryptocrystalline, with n = about 1.66 and intense blue color. At some localities, however, microscopically fibrous to bladed material occurs, and this gave alpha = 1.64 to 1.65, beta = 1.65, gamma = 1.66. The pleochroism is X yellow, Y green, Z blue. The double refraction varies from one specimen to another, but is sometimes so low that

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[2] Second Geol. Survey Penna. Rept. D 3, II, 1: 93–94. 1883.

[3] Bull. Amer. Mus. Nat. Hist. 32: 517–526. 1913.

anomalous interference colors due to high dispersion in some indeterminate direction are shown. One of the best samples for optical study came from a road metal quarry southwest of the town of Mohnton, Berks County, the rock being a highly metamorphosed Triassic sandstone. Other noteworthy localities in similar rock, as well as in the Triassic diabase causing the alteration, lie three miles—5 kilometers—south of the city of Reading, and just east of Little Oley, south of Boyertown, Berks County. In addition to the pre-Cambrian gneiss occurrences listed by Mrs. Knopf, it is abundant in these rocks north of Oley Line, Berks County, and northeast of Dillingerville, Lehigh County. It also occurs for some miles northeastward from Riegelsville, Pa., in the state of New Jersey. In all perhaps fifty localities are known.[4]

TABLE 1.—ANALYSIS AND RATIOS OF CROCIDOLITE FROM OLEY LINE, PA.

	Analysis	Ratios	Theory
SiO_2	51.62	0.86 or 6	50.7 (6)
Al_2O_3	0.92	0.01	
Fe_2O_3	18.36	0.12 or 1	22.4 (1)
Ti_2O_3	2.27	0.02	
FeO	10.93	0.15 or 1	10.1 (1)
MgO	5.92	0.15	5.6 (1)
CaO	0.48	0.01 or 1	
Na_2O	5.62	0.09 or $^9/_3$	8.7 (1)
K_2O	0.66	0.01	
H_2O^+	2.57	0.14 or $^4/_3$	2.5 (1)
H_2O^-	1.04	0.06	
Sum	100.39		100.0

Becoming interested in the identity of the mineral, the junior author analyzed a sample from the locality north of Oley Line, which was kindly selected and purified by Mr. C. S. Ross of the U. S. Geological Survey, and proved to be cryptocrystalline and homogeneous on microscopic examination. The analysis, the first made on pure material, showed the mineral to be a semimagnesium crocidolite, with the formula $H_2O.Na_2O.MgQ.FeO.Fe_2O_3.6SiO_2$.

The high percentage of titanium present suggests that this element, in its lower state of oxidation, may partially account for the extremely intense color of the mineral, although admittedly part of the color is due to iron. Titanium has therefore been regarded as replacing aluminium and iron, rather than silicon. The low content of alkalies

[4] Professor A. H. Phillips reports it also in the highlands of New York State. It is represented in some mineral collections under the name vivianite.

is evidently connected with partial replacement of sodium by hydrogen, total alkalies plus total water amounting to the theoretical ratio of 2. The rôle of water in the glaucamphiboles appears never to have been studied, but as most of the analyses show on the average 2% of this constituent, it is probably at least in large part essential.

It is interesting to consider the mode of occurrence of the material: it is found as impregnations and coatings in gneissoid rocks of pre-Cambrian age, in diabase of Triassic age, and in sediments of the latter age intruded by the diabase. The gneisses thus impregnated are usually greatly shattered; the crocidolite not only fills the resulting crevices, but also replaces the original minerals of the gneiss. Replacement of hornblende was described by Mrs. Knopf, and it may be added that the rocks, which usually contain considerable primary quartz where unaltered, are practically free from this mineral in extensively crocidolitized zones. Some of the silica has been redeposited, with the crocidolite, in the form of secondary quartz. The same phenomenon is noticeable in the replacement of these gneisses by sericite[5] which is of frequent occurrence in the region, namely that the primary quartz is replaced more rapidly than the feldspar. This points to the deposition of the crocidolite, like the sericite, from hydrothermal solutions. The shattering of the crocidolitized gneisses is, in the experience of the senior writer, almost always connected with faulting of late Triassic date, and since the same mineral occurs in the late Triassic diabase and the sediments it has metamorphosed, the suggestion is here made that the hydrothermal solutions which deposited the crocidolite in the various occurrences came alike from the Triassic diabase magma.

PALEONTOLOGY.—*Middle Eocene Foraminifera of the genus* Dictyoconus *from the Republic of Haiti.*[1] WENDELL P. WOODRING, U. S. Geological Survey.

In 1900, Chapman (1, pp. 11–12, pl. 2, figs. 1–3) described as *Patellina egyptiensis* a curious conical species of Foraminifera that was collected in northern Egypt between Cairo and Suez from rocks that were then supposed to be of lower Miocene age. The generic name *Patellina* was used by Chapman as the equivalent of *Orbitolina*. Blanckenhorn (2, pp. 419, 432–435) showed that the rocks from which Chapman's specimens were collected are part of the lower Mokattam group of mid-

[5] WHERRY. Bull. Geol. Soc. Amer. 29: 383. 1918.

[1] Published by permission of the Engineer in Chief, Republic of Haiti, and of the Director, U. S. Geological Survey. Received April 24, 1922.

dle Eocene (Lutetian) age. As *Patellina egyptiensis* is different from the Recent species of *Patellina* and the Cretaceous species of *Orbitolina*, Blanckenhorn proposed for it the new generic name *Dictyoconus*.[2] Blanckenhorn considered *Dictyoconus* a guide genus of the lower "Mokattamstufe." *Dictyoconus egyptiensis* was fully described by Schlumberger and H. Douvillé, 1905 (**3**, pp. 298–304, pl. 9).

During a geological reconnaissance of the Republic of Haiti in the winter of 1920–1921 by J. S. Brown, W. S. Burbank, and myself, numerous specimens of two new species of *Dictyoconus* were collected from a limestone that crops out in the central and southern parts of the western half of the Département du Nord. The limestone was named by Vaughan (**4**, pp. 58, 94) the Plaisance limestone. The most abundant species is remarkably similar to *Dictyoconus egyptiensis;* but the other species is even more depressed than the microscope form of *Dictyoconus egyptiensis* figured by Schlumberger and H. Douvillé, and it has an undulate base. These Haitian species will be described in a report on the geology of the Republic of Haiti now being prepared for publication. Thin sections show that they have the same internal structure as the Egyptian specimens.

The structural relations of the Plaisance limestone indicate that it is of middle Eocene (Lutetian) age, and not of upper Eocene (Priabonian) age, as was supposed when it was named. The evidence furnished by the Foraminifera seems to be a striking confirmation of its middle Eocene age. The Plaisance limestone is the first formation of middle Eocene age recognized in the West Indies proper, as the upper Eocene is the only one of the commonly accepted subdivisions of the Eocene heretofore recognized (**5**, p. 607).

A third species of *Dictyoconus* was collected at many localities in the northern part of the Republic from rocks that are clearly of upper Eocene (Priabonian) age. This species is found with *Orthophragmina crassa* Cushman, *Orthophragmina cubensis* Cushman, and other upper Eocene orbitoidal Foraminifera, and it seems to be similar to *Dictyoconus americana* (Cushman), which was described from the upper Eocene (Priabonian) St. Bartholomew limestone of the island of St. Bartholomew (**6**, p. 43, text fig. 3). The species described from St. Bartholomew is the only American species that has heretofore been described. Cushman (**4**, pp. 105, 106) has recorded the same or a similar species from the upper Eocene of the Dominican Republic.

[2] On p. 419 where the genus is first mentioned by Blanckenhorn the spelling is *Dictyoconus*, but on the following pages the less desirable spelling *Dictyoconos* is used.

Similar conical Foraminifera of Eocene age have commonly been called by the generic name *Conulites*, and Chapman in 1902 (**7**, pp. 156–157, 276, pl. 8, figs. K, k, text fig. 36) called the Egyptian species *Conulites aegyptiensis*. The genus *Conulites* was described by Carter in 1861 (**8**, pp. 331–332, 457–458, pl. 15, figs. 7, 7a–g; **9**, pp. 53–54, 83–84) for a species of Foraminifera, apparently of middle Eocene (Kirthar) age, from western India. According to Carter's description and figures the Indian specimens have a different structure from the Egyptian and West Indian specimens. Blanckenhorn (**2**, p. 433) suggested that some of the Foraminifera described by Carter in the same papers as *Orbitolina* are similar to the Egyptian *Dictyoconus*.

In 1904 Prever and Silvestri (**10**, pp. 470, 477–486, figs. 1–5) proposed the new generic name *Chapmania* for *Patellina egyptiensis* on the invalid grounds that *Dictyoconus* was a synonym of *Orbitolina*, and was briefly described and not figured. They described and figured under the name of *Chapmania aegyptiensis* (Chapman) a middle Eocene species of Foraminifera from Italy that has a different structure from the Egyptian and West Indian specimens. Silvestri (**11**) and Airaghi (**12**, p. 160; **13**, pp. 182–185, pl. 5, figs. 1–4) recorded this Italian species from several localities. In view of the differences between the Egyptian and Italian species Silvestri later (**14, 15**) redescribed the Italian species as *Chapmania gassiensis*.[3]

In 1912 Schubert (**16**) described and figured *Coscinolina liburnica* Stache, a genus and species from basal middle Eocene rocks of the Istrian-Dalmatian coast that had been imperfectly described by Stache in 1875 (**17**). *Coscinolina* has a more pronounced early spiral stage than *Dictyoconus or "Chapmania,"* and was considered by Schubert as a more primitive type. *Coscinolina liburnica* has been recorded by H. Douvillé (**18, 19**) from northern Egypt in beds below the horizon of *Dictyoconus*.

The available records show that these conical Eocene Foraminifera, *Conulites*, *Dictyoconus*, *Coscinolina*, and the Italian genus called *Chapmania*, are strictly tropical. Their range in latitude is even more limited than the range in latitude of the orbitoidal genera *Orthophragmina* and *Leipdocyclina*, which migrated northward to southwestern France and to the southern Coastal Plain of the United States. The remarkable similarity of the Egyptian and West Indian species of *Dictyoconus* is another example of the striking resemblance of the

[3] As *Chapmania* is a synonym of *Dictyoconus*, the Italian species should receive a new generic name.

West Indian Tertiary faunas to those of the same age in the Mediterranean region.

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INORGANIC CHEMISTRY.—*The crystal structures of the alkali halides.*[1] II. EUGEN POSNJAK and RALPH W. G. WYCKOFF, Geophysical Laboratory, Carnegie Institution of Washington.

These determinations of the crystal structures of the halides of lithium and the fluorides of the alkali metals have been carried out by the same procedure and with the same apparatus used for part I of this paper.[2] Except for RbF and CsF, determinations of density were at hand for use in finding the number of molecules to be associated with the unit cube. In all cases data will be given for only enough lines to assure the correctness of the chosen structure. In every instance the other lines that appeared gave satisfactory agreement.

LITHIUM FLUORIDE

This salt has already been determined[3] to have the "sodium chloride" structure (fig. 1, part I). According to this previous measurement the length of the side of the unit cube is 4.14 A. U. (or 4.14×10^{-8} cm.).

LITHIUM CHLORIDE

hkl	Estimated intensity	Calculated intensity	
		NaCl grouping	ZnS grouping
111 (1)	10	6,900	10,500
100 (2)	10	7,530	3,700
110 (2)	6	6,640	6,640
113 (1)	4	4,480	6,800

Calculated density = 2.02.
Spacing: $d_{100} = 5.17 \pm 0.02$ A. U.
Structure: NaCl grouping (fig. 1, part I).

LITHIUM BROMIDE

hkl	Estimated intensity	Calculated intensity	
		NaCl grouping	ZnS grouping
111 (1)	10	36,100	43,400
100 (2)	9	27,200	19,300
110 (2)	6	24,000	24,000
113 (1)	4	23,400	28,200

Calculated density = 3.46.
Spacing: $d_{100} = 5.48 \pm 0.02$ A. U.
Structure: NaCl grouping.

[1] Received April 20, 1922.
[2] RALPH W. G. WYCKOFF. This JOURNAL 11: 429. 1921.
[3] P. DEBYE and P. SCHERRER. Phys. Z. 17: 277. 1916.

LITHIUM IODIDE

Considerable difficulty was experienced in preparing anhydrous LiI. The salt which was finally used was fused in an atmosphere of hydrogen and, immediately upon solidification, was powdered and enclosed in a capillary glass tube. A couple of faint lines which were found upon the photographs, but which could not be associated with LiI are undoubtedly due to hydration or decomposition products of this salt. The agreement between the estimated intensities and those calculated from the commonly employed assumptions is not so good as usual.

hkl	Estimated intensity	Calculated intensity NaCl grouping	Calculated intensity ZnS grouping
111 (1)	10	88,000	99,200
100 (2)	10	59,100	47,200
110 (2)	6	52,200	52,200
113 (1)	6	57,100	64,500

Calculated density = 3.94.
Spacing: $d_{100} = 6.06 \pm 0.02$ A. U.
Structure: Probably the NaCl grouping.

SODIUM FLUORIDE

hkl	Estimated intensity	Calculated intensity NaCl grouping	Calculated intensity ZnS grouping
111 (1)	Absent	141	7,100
100 (2)	10	7,500	75
110 (2)	8	6,650	6,650
111 (2)	3	2,750	27
100 (4)	2	1,480	1,480
120 (2)	4	4,520	45

Calculated density = 2.78.
Spacing: $d_{100} = 4.61_5 \pm 0.01$ A. U.
Structure: NaCl grouping.

POTASSIUM FLUORIDE

hkl	Estimated intensity	Calculated intensity NaCl grouping	Calculated intensity ZnS grouping
100 (2)	10	15,100	1,890
110 (2)	9	13,300	13,300
111 (2)	2	5,500	676
120 (2)	4	9,030	1,160
112 (2)	3	7,340	7,340

Calculated density = 2.48.
Spacing: $d_{100} = 5.36 \pm 0.01$ A.U.
Structure: NaCl grouping.

RUBIDIUM FLUORIDE

The diffraction effects observed upon photographs from four different preparations of RbF were essentially the same. They are,

however, so difficult to reconcile with any simple structure for this salt that further work will be necessary to establish its structure with certainty.

CAESIUM FLUORIDE

The density of this salt, as approximately determined from a measurement of its refractive index[4] indicates that four molecules are to be associated with the unit cube. The diffraction data are in such good agreement with a structure containing this number of molecules in the unit that there is little reason for doubting the correctness of the structure here assigned (which is different from that of all of the other caesium halides).

hkl	Estimated intensity	Calculated intensity NaCl grouping	Calculated intensity ZnS grouping
111 (1)	10	74,600	109,200
100 (2)	10	77,200	40,000
110 (2)	7	68,200	68,200
113 (1)	6	48,500	70,800
100 (4)	1	15,200	15,200
120 (2)	3	46,300	24,000
112 (2)	2	37,600	37,600

Calculated density = 4.52.
Spacing: $d_{100} = 6.03 \pm 0.02$ A. U.
Structure: NaCl grouping.

Discussion of these structures.—The data concerning (1) the structures, (2) the dimensions of the unit cells, and (3) the distance of nearest approach of unlike atoms in each crystal of this series are collected in table 1.[5]

On the basis of the available crystal structure data, volumes of "spheres of influence" have been assigned[6] to various atoms and crystals imagined as resulting from a close packing of these atomic spheres. The extent to which these measurements are in agreement with such an hypothesis may be tested by assigning to some one atom an indefinite radius a and obtaining the radii of the other atoms in terms of a. If this is done the calculated distances R–X of table

[4] We wish to thank Dr. H. E. Merwin of this Laboratory for determining the refractive index of caesium fluoride, and suggesting the estimation of its density therefrom. The index is 1.478 ± 0.005. Applying Gladstone's law and using the specific refractive energies given by E. S. Larsen (U. S. Geol. Survey Bull. **679:** 31), the density of caesium fluoride is found to be approximately 4.38.

[5] After completing our determinations of the structures of the alkali halides we have become aware of previous work upon some of them through a paper by A. W. HULL. Journ. Frankl. Inst., 193, 217. 1922.

[6] W. L. BRAGG. Phil. Mag. VI, **40:** 169. 1920.

1, which are in excellent agreement with the observed distances, are the result. An hypothesis of constant atomic dimensions in crystals which is based on the most reliable data meets, however, with such serious difficulties when passing from compounds of one type to those of another that it can scarcely now be said what significance attaches to such numerical agreements as this one.

TABLE 1.—SUMMARIZED DATA ON THE ALKALI HALIDES

Crystal	Structure	Side A. U.	Distance R–X Observed A. U.	Distance R–X Calculated A. U.
LiF	NaCl (Fig. 1)	4.14	2.07	2.08
LiCl	NaCl (Fig. 1)	5.17	2.58[5]	(2.58[5])
LiBr	NaCl (Fig. 1)	5.48	2.74	2.74[5]
LiI	NaCl (Fig. 1)	6.06	3.03	3.01
NaF	NaCl (Fig. 1)	4.62	2.31	(2.31)
NaCl	NaCl (Fig. 1)	5.62[5]	2.81[4]	(2.81[4])
NaBr	NaCl (Fig. 1)	5.95	2.97[5]	(2.97[5])
NaI	NaCl (Fig. 1)	6.47	3.23[5]	(3.23[5])
KF	NaCl (Fig. 1)	5.36	2.68	2.63
KCl	NaCl (Fig. 1)	6.26	3.13	(3.13)
KBr	NaCl (Fig. 1)	6.59	3.29[5]	3.29
KI	NaCl (Fig. 1)	7.11	3.55[5]	3.55
RbF	.....	..	..	...
RbCl	NaCl (Fig. 1)	6.60	3.30	(3.30)
RbBr	NaCl (Fig. 1)	6.93	3.46[5]	3.46
RbI	NaCl (Fig. 1)	7.36	3.68	3.72
CsF	NaCl (Fig. 1)	6.03	3.01[5]	3.06
CsCl	Body-centered (Fig. 2)	4.12	3.56	(3.56)
CsBr	Body-centered (Fig. 2)	4.30	3.73	3.72
CsI	Body-centered (Fig. 2)	4.55	3.94	3.98

Note: The distances in parentheses are used to calculate the values in the last column.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

BIOLOGICAL SOCIETY OF WASHINGTON

629TH MEETING

The 629th meeting of the Biological Society of Washington, was held jointly with Washington Academy of Sciences and the Botanical Society of Washington on November 12, 1921 in the Lecture Hall of the Cosmos Club at 8:00 o'clock under the Presidency of the Academy.

Prof. ARTHUR DE JACZEWSKI, Director of the Institute of Mycology and Pathology at Petrograd, delivered an address on *The development of mycology and pathology in Russia.*

Prof. NICOLAS I. VAVILOV, Director of the Bureau of Applied Botany and

Plant Breeding at Petrograd delivered an address on *Russian work in genetics and plant breeding.*

Dr. VERNON L. KELLOGG, Permanent Secretary of the National Research Council, lead a discussion on *The interrelations of Russia and American scientists.*

630TH MEETING

The 630th meeting was held in the Lecture Hall of the Cosmos Club November 26, 1921. President HOLLISTER presided and 44 members were present. Upon recommendation of the Council Mr. THOS. E. PENARD and Dr. T. VAN HYNING were elected to membership. The program was as follows:

R. W. SHUFELDT: *Changes in the skull of an American badger* (Taxidea americana) *due to extreme old age* (illustrated). A reading of Dr. Coues' descriptions of badger skulls, evidently based upon small and imperfect ones, led to an examination of the series in the National Museum. It was found that as distinguished from skulls of young animals, the skulls in older specimens showed a large median crest, with other cranial developments such as greatly developed and outwardly curved zygomas, and a great contraction or pinching of the cranium. These changes in the skull are correlated with the development of the masseter muscles as the specimen grows older.

J. W. GIDLEY: *The* Primates *of the Paleocene.* Information regarding the origin of the Primates is of special interest to man because it is the order to which he belongs, as well as the living lemurs, apes, and monkeys. Fossil primate material is rare and generally fragmentary, and the discussions and conclusions upon the early life history and development of the Primates are necessarily incomplete.

Primates have long been known from the Eocene, but older forms have been found in the Fort Union formation which is Paleocene. In the Eocene of America, two distinct groups of Primates have been recognized, each with several genera and species. One of these, as shown by Matthew, is a subfamily of *Tarsiidae,* and includes at least five groups of supergeneric rank. The other Eocene group, as shown by Gregory, is a subfamily of the European Eocene family *Adapidae* (*Notharctidae*).

Regarding the relationships of the Eocene Primates and especially the Adapidae to the living groups of Primates, there exists among authorities considerable difference of opinion. But there has been a rather generally accepted view that these early Primates were, at least, representative of, if not ancestral to all, or nearly all, of the living lemurs, apes and monkeys. Gregory attempts to show from the lemur-like characters in the Notharctid group, that they are true primitive lemurs, comprising a group of Primates "which is at once the oldest and most primitive which is known from adequate material," establishing an early skeletal type "relatively near to the base of the order, and representing in many respects the earliest ancestors of the higher Primates." Also Gregory describes a hypothetical Paleocene group ancestral to both the *Tarsiidae* and Adapidae (Notharchidae) of the Eocene.

Mr. Gidley stated that his researches in the Paleocene faunas from the Fort Union collection in the National Museum reveals four groups of supergeneric importance: two of them represent new subgroups of the Tarsiidae as defined by Matthew, one is referable to one of Matthew's Eocene subgroups, and the fourth represents the genus *Nothodectus,* described by Matthew and referred by him to a new family, the Nothodectidae. No species was found fulfilling the requirements of a near relative of the Notharctidae, or the hy-

pothetical Paleocene group. Hence Dr. Gregory's contention regarding the evolutionary status of the Notharctid group is not well founded. This conclusion Gidley has substantiated by a restudy of the Eocene Primates, and finds that the Notharctids could not have given rise to any modern lemurs, and because of their advanced stage of development cannot be considered a close connecting link between the Primates and the Insectivores as advanced by Gregory. Mr. Gidley, on the other hand, concludes that since the subfamily groups of the Eocene, which were represented in the Paleocene, are found to be almost as clearly marked in their special lines of development, the origin of these groups is still more remote and the order of Primates and its families have been established longer than has generally been conceded.

Mr. Gidley's paper was discussed by Dr. T. S. PALMER.

J. M. ALDRICH: *An entomologist in Alaska* (illustrated). The speaker visited Alaska last summer for the purpose of making a collection of insects of the interior for the National Museum. He went by steamer to Seward, then up the new government railroad to Fairbanks, and returned the same way. At the time of his visit there was an unfinished portion of the railroad of some 80 miles; he rode a horse across this, but it has since been practically completed. Economic conditions in the interior of the territory he described as very bad on account of the abandonment of gold mining in the last few years. It was hoped that the completion of the railroad would reduce operating costs enough to warrant a resumption of mining, upon which all other activities of the interior depend.

Alaska as far as seen by the speaker is almost wholly forested but the timber away from the coast is thin and small. The rainfall is very heavy along the extreme coast, but behind the first ranges it is much less, and over the main expanse of territory it is about ten or eleven inches; even at the coast north of the Aleutian peninsula it is very light. Agriculture however has been begun in some sections. Crops grow best in the interior, on account of the hotter summers; the region of Fairbanks has considerable possibilities if a population were there to consume the farm products. Lack of market at present makes the business impracticable.

Entomologically the abundance of mosquitoes is one of the chief features. These insects make life a burden during their season, June and July, necessitating various adaptations for protection on the part of the human species. Horseflies and several other kinds of blood-sucking flies are abundant at times or in particular regions. The relations of the fauna are with the Canadian zone of the northern part of the United States and the higher Rocky Mountains in the States; another element follows the Pacific ocean southward along Puget Sound and the coast of Washington and Oregon; no doubt other elements extend to Greenland and westward across Siberia, but these are almost wholly unknown.

Lantern slides were shown illustrating the vegetation, islands, mountains and glaciers, as well as the new railroad to the interior.

Dr. HADWINN, of the Biological Survey, was introduced by Dr. L. O. HOWARD. Dr. HADWINN campared the region discussed with the tundra region in which his collecting was done.

631ST MEETING (42ND ANNUAL MEETING)

The 631st regular meeting and the 42nd annual meeting of the Biological Society of Washington was held at the Cosmos Club, December 10, 1921.

President HOLLISTER called the meeting to order at 8:15 o'clock, with 21 persons present.

Reports were received from the Recording Secretary, Corresponding Secretary, and Committee on Publications. The report of the Treasurer was read, and upon the hearing of the Auditing Committee, consisting of Messrs. OBERHOLSER, HOWELL, and GOLDMAN, was accepted. A Committee of the Council, appointed to draft a memorial to the late WILLIAM PALMER, presented the memorial, which was ordered inserted in the minutes. The Committee consisted of Drs. J. N. ROSE, CHAS. W. RICHMOND, PAUL BARTSCH, and HARRY C. OBERHOLSER. The Corresponding Secretary announced the death of Mr. S. S. VOORHEES.

The balloting for officers of the Society and Members of the Council resulted as follows: *President*, VERNON BAILEY; *Vice Presidents*, A. S. HITCHCOCK, J. W. GIDLEY, S. A. ROHWER, HARRY C. OBERHOLSER; *Recording Secretary*, J. M. ALDRICH; *Corresponding Secretary*, T. E. SNYDER; *Treasurer*, FREDERICK C. LINCOLN. *Members of the Council*, E. A. GOLDMAN, H. H. T. JACKSON, R. E. COKER, R. W. WILLIAMS, W. R. MAXON.

Dr. HOPKINS moved the nomination of VERNON BAILEY as one of the Vice Presidents of the Washington Academy of Sciences.

Dr. PALMER moved that the joint meeting of the Society of Nov. 12, 1921, be included in the series of regular meetings, and that the proper consecutive number be resumed in January; carried.

During the intervals of the balloting the following brief notes were given: Prof. C. V. PIPER: *Note upon Panicum kuntzii*. This grass, otherwise rare, is abundant in a wide region in Florida. It seems not to have been recognized because it rarely blooms. It is locally known as "cut-throat grass" because it occurs in channels called "cut-throats." Cattle eating the grass become salt sick.

Dr. L. O. HOWARD suggested that since the Society is one of the few remaining strongholds of the old fashioned natural history, that a program be arranged in which the old and new view-points can be discussed. Prof. PIPER stated that the broader point of view is emphasized in Shull, Larue, and Ruthven's *Principles of animal biology*. Dr. Howard added Needham's *General biology, and* Cockerell's *Zoology*. Mr. DOOLITTLE said that the death of JOHN BURROUGHS has given impetus to the organizing of nature clubs in the public schools.

Mr. F. C. LINCOLN mentioned the peculiar feeding habits in North Dakota of the sharp-tailed grouse, eating service berries, and buds and flowers of the rosinweed. Prof. PIPER and Mr. GOLDMAN commented upon the great increase of the Hungarian partridge in the Palouse country and elsewhere in Washington. Dr. PALMER added that the birds were introduced in 1914.

A. A. DOOLITTLE, *Recording Secretary.*